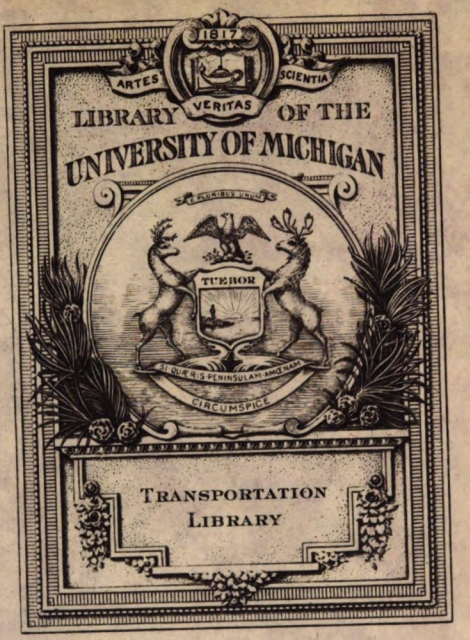
Building a Railroad



Building a Railroad

A HANDBOOK DEVOTED TO A NEW, SPEEDY AND ECONOMICAL METHOD OF PERFORMING EVERY OPERATION FROM GRADING RIGHT-OF-WAY TO BALLASTING AND MAINTAINING TRACK

FIRST EDITION.

Published by the

American Hoist & Derrick Co.

ST. PAUL, MINN.

Foreword

THE title of this book, "Building a Railroad," is an ambitious one, covering, as it does, a subject which might well fill a number of fat volumes if all the methods of building railroads were gone into. The purpose of this book, however, is to cover only one method, but that one the newest, swiftest, most economical of them all.

When the engineer has put his best into the planning of a road, settled the grades and cuts and fills and curves and made his estimate of costs, no matter how well he has planned, on his head is apt to fall the blame for any flaws that may develop in the actual operation of the road. Wherever the human element comes in strongly, cost and time are bound to be the most important factors and in few undertakings does the man with the pick and shovel play a more important part than in the building of a railroad. But even granting that the labor expended on the building of a railroad is superlatively intelligent, thorough and industrious, it can never equal the thoroughness and untiring industry in all kinds of weather of a perfect machine. Such a machine is the "*American*" Railroad Ditcher, a machine which executes perfect plans perfectly, cuts down large crews and, by reducing the fallible human element, diminishes the possibility of mistakes and poor work. With it no other track building equipment is required, for it is twenty machines in one, as a reading of the following pages will show.

Though admittedly this little book was compiled to exploit the "*American*" Railroad Ditcher, yet it was written by practical men and embodies the results of long experience. The methods described have proved money savers and should, therefore, commend themselves to all interested in the building of railroads and the efficient maintenance of right-of-way.

Introducing the "American" Railroad Ditcher

Big Hand Crew Laying Track

The "*American*" Railroad Ditcher consistently eliminates men and the labor problem in everything it does. Instead of the "many foreigners" or laborers, with minimum results for the worry and investment, there is "*One American*" with maximum results.

What Does This Mean in Railroad Building?

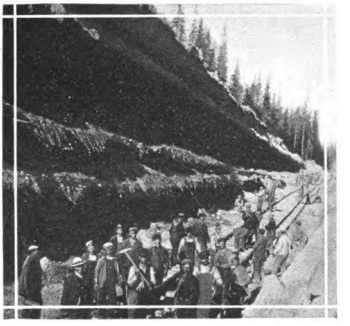
First—Time is saved. With an "*American*" Ditcher on the job the work is done when it should be done, without waiting for the contractor or any one else.

Second—Money is saved. The contractor's profit is eliminated and forces are utilized that would lie inactive if the work were contracted.

Third—Investment in an "*American*" Ditcher is always a live one.

The contractor cannot make as close a price for a short extension as for a big job, unless it is heavy work, because it costs as much to move his equipment to build a few miles as it does to do the big job. The "*American*" is desirable for the small jobs because it cleans them up quickly and efficiently, and other uses will be found for it long before ready to release it from the work it is on. It is a winner both ways in that instance, and the more "*Americans*" installed the more time and money can be saved.

The "*American*" is not only very efficient in a



Big Crew, Big Expense

big job, but in short extension work it is common for it to pay for itself in a comparatively short time.

It makes an excellent showing over a hand crew in any situation, saving big money in every job it tackles. It often makes its best record where the hand crew makes its poorest showing, because it accomplishes results that a hand crew often cannot secure at all. Climatic and weather conditions that knock out the hand crew completely, serve only to put the "*American*" on its mettle and open one's eyes as to what it really will do.

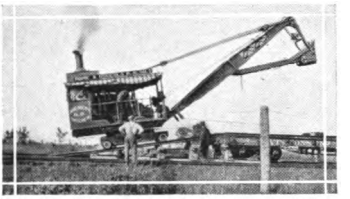
In actual practice the "*American*" will grade and build a railroad from "stem to stern," making light cuts and casting the material over as it works from the grade center; making light fills by borrowing from the side, or working down on the side and casting material up on the grade. It pulls stumps, removes trees and boulders, drives piling, builds bridges and culverts,—traveling overland all the time from place to place, or over the grade just completed, upon portable track sections which it readily transfers. It will lay or relay and shift track; it serves admirably in digging ballast and spreading same ready for the surfacing crew.

Just think what this means to the small as well as big road. The "*American*" Railroad Ditcher with a single operator, aside from the fireman, is a Steam Shovel, Pile Driver, Track Layer, Locomotive Crane, Light Locomotive, Ballast Digger and Spreader,—and after the road is built it is the best maintenance machine in the world.

Starting the Job

Crew line-up:

One operator for "*American*" Ditcher.
One fireman for "*American*" Ditcher.
Two laborers.



Ditcher Unloading Itself From Flat Car

Suppose an "*American*" Railroad Ditcher has been received and it is desired to run it off the flat car. The machine when shipped from the factory rests upon four-inch hardwood boards, the two portable track sections lying in front of machine on the car. After the machine is set up and put under steam, proceed as follows:

First—Lift the narrow section of transfer track off the car onto the ground alongside.

Second—Place the wider section in proper position on deck of car with ends of rails flush with end of car.

Third—Run machine off the boards on which it was shipped onto the rail section thus placed.

Fourth—Pick up the narrow section, swing it around and place it with one end on the car between the wide section, and the other end on ground, ends resting against a tie to prevent slippage.

Fifth—Now crib up under the rails with ties to give proper support to the machine when it passes over.

Sixth—Run a line from the pull-back drum to end of car opposite the end from which machine is to descend, having this line pass over end of car and fasten to rail on surface track. This line will keep machine from descending too fast, and will also hold car from rising or moving on track. The machine now travels down to the surface on its own power, the boom

Ditcher Traveling On Its Own Track

extended to back of car, or in opposite direction from which machine is leaving the car. See that foot brake on pull-back drum is sufficiently tight to hold machine from descending too rapidly.

Seventh—By spacing the rail section on the cribbing so that the lower ends of rails are equally distant from the surface track, the machine will run down onto the surface track on the auxiliary, standard gauge truck wheels. Before starting off the car, be sure car wheels are blocked both ways to keep car from moving.

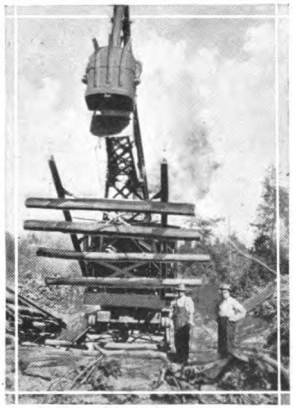
General Remarks

The "*American*" travels under its own power on the surface track in either direction. The machine can be run off the end of a spur onto the portable track sections where there is work for it to do, or it can be quickly set out from the surface track onto the portable track sections without cutting a rail, as fully explained under "Straight Steam Shovel Work," pages 24 and 25.

The machine may now move overland any distance or from place to place on the portable track sections as desired.

The laborers in the crew serve as handy men on the ground. Their main work is to remove obstructions or smooth up in front of machine so the portable track will lie level and firm. The fireman usually has time

Ditcher Swinging One Of Its Portable Sections



Ties Spiked To Rails For Traveling over Spongy Ground

to hook chain to portable track section each time one is transferred. If the move is long enough a man and team will be required to provide fuel and water.

Two 26 ft. 100 lb. steel, telescopic portable track sections are regularly furnished for traveling over flat cars, or on the ground for construction work.

The "*American*" travels easily and quickly over these track sections, which it transfers as the work progresses. These track sections are solidly bound together with separator bars, and furnished with bridle chains for use in lifting them, and are of different gauges to accommodate the double flanged, double tread, truck wheels. In use the track sections telescope, and are chamfered off at the intersection, so that it is not necessary for the sections to be laid accurately, or in line. This facilitates turning corners. There is sufficient flexibility or "give" to accommodate the track in moving over average uneven ground.

The truck is also furnished with auxiliary, standard gauge wheels, which permit the machine to travel down on either permanent or temporary surface track.

These auxiliary truck wheels can, by arrangement beforehand, be set at 36 inch or 42 inch gauge.

Ties spiked to the rails make it possible to easily go over soft, spongy ground that could not be safely passed over with any kind of a traction wheel. Where the roadway is uniformly good, no ties are required, and ties can be placed under temporarily without spiking to the rails.

Preparing the Right-of-Way for Grading

Clearing Ahead of the Machine

Clearing Timber From Right-of-Way

Timber on the right-of-way is felled and cut to length in the customary manner, by hand crew, placing to side of the right-of-way to be loaded on cars by the machine any time after the road is completed.

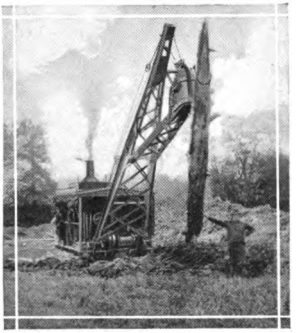
Grubbing, Removing Stumps and Boulders

Crew line-up:

One operator for "*American*" Ditcher.
One fireman for "*American*" Ditcher.
Two laborers.
One man and team.

The two laborers chain stumps and boulders to dipper and act as handy men on the ground. Man and team furnish fuel and water. An ideal water tank holds 10 barrels of water, with box on top for approximately 1000 lbs. coal. If track is laid down to machine, as the grade is completed, the fuel and water may be supplied from that source.

In making cuts the machine grubs around or undermines a stump so that it is easily pulled out,



Removing a Stump

if the cut is light, or falls down into the cut if it is deeper.

In "scratch" work, or where the machine cannot dig around the stump, as it does in making cuts, it is advisable to loosen up the stumps with from 15 to 20 lbs. of powder to the station of 100 ft., as compared with 35 to 40 lbs. by the "arm" strong method. The stump is then pulled out bodily by the machine by running a chain from stump to center dipper tooth and hoisting the dipper.

The grubbing and grading are both done at one setting of machine, completing the grade as it goes.

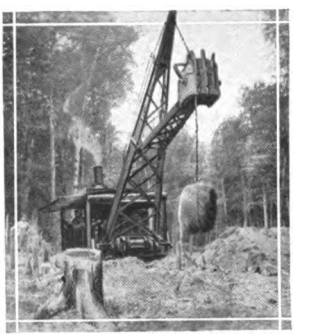
Boulders and stumps are not only removed from where imbedded, but are conveyed by the machine out of the way, clear of the grade. The "*American*" deposits stumps and boulders 30 feet on either side of the center grade line, thus clearing a 60-foot right-of-way, and with the "pullback" drum can remove such material to a greater distance if desired, by use of snatch block. This drum holds 725 feet of $\frac{5}{8}$ inch wire rope.

The steam shovel fails in this performance for the the following reasons:

First—Fixed boom radius.

Second—Does not work in full circle.

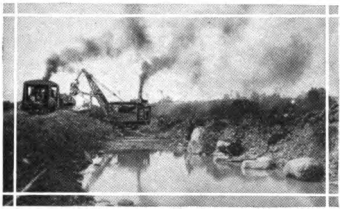
Third—Has no extra drum for doing special work.



Lifting Out a Big Boulder

Grading—Making Cuts

Working Against a Light Face and Casting Over



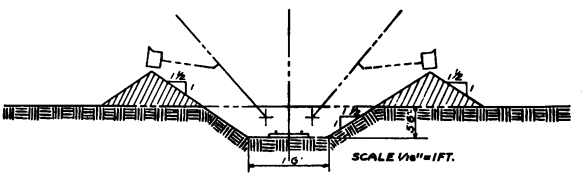
Ditcher Working in a Cut

Crew line-up same as in grubbing and pulling stumps:

One operator for "*American*" Ditcher.
One fireman for "*American*" Ditcher.
Two laborers.
One man and team.

With the "*American*" on center grade line the maximum cut that can be made and cast all the material over on the sides, so the material will not fall back into the cut, is

Depth of cut, 5 ft. 6 in.
Width at bottom, 16 ft.
Slopes, 1½ to 1.

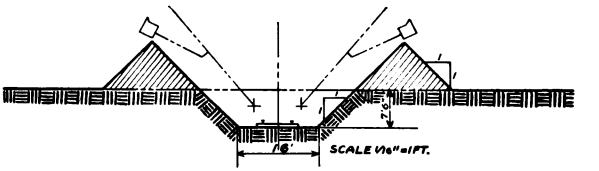


"American" Making Cut 5'-6" Deep, 16' Wide, 1½ to 1 Slopes, and Casting Spoil Over Far Enough So It Will Not Fall Back Into Cut.

The "*American*" will, under the same conditions, make the following:

Depth of cut, 7 ft. 6 in.
Width at bottom, 16 ft.
Slopes, 1 to 1.

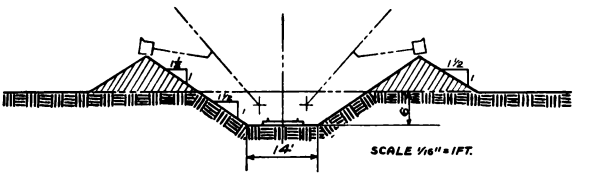
Or—Depth of cut, 6 ft.
Width at bottom, 14 ft.
Slopes, 1½ to 1.



"American" Ditcher Making Cut 7'-6" Deep, 16' Wide, 1:1 Slopes, Spoil Banks Have 1:1 Slopes.

Or—Depth of cut, 8 ft.
Width at bottom, 14 ft.
Slopes, 1 to 1.

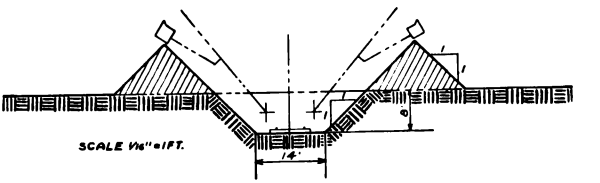
With the *"American"* on center grade line, the maximum cut that can be made by removing with



"American" Ditcher Making Cut 6' Deep, 14" Wide, Slopes 1½ to 1, and Casting Spoil Far Enough Over to Prevent It From Falling Back Into the Cut.

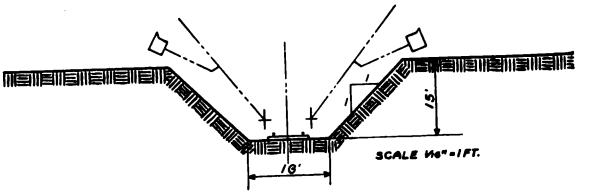
slip scrapers the material which has been cast up on the bank is:

Depth of cut, 15 ft.
Width at bottom, 16 ft.
Slopes, 1 to 1.



"American" Ditcher Making Cut 8' Deep, 14' Wide, 1:1 Slopes on Both Cut and Spoil Banks.

Four telescopic track sections, each 10 ft. long, are desirable for this class of work, rather than two 26 ft. sections regularly furnished with the machine, because the proper digging radius in such work only permits digging far enough ahead to allow the shorter sections to be placed in the excavation ahead. These



"American" Ditcher Making Cut 15' Deep, 16' Wide at Bottom, Slopes 1:1, Spoil Removed as Deposited.

short track sections can usually be made right on the ground from rails on hand. Ties should be spiked to the 10 ft. track sections to hold them together and to keep them from sinking too deeply into the fresh grade. Four telescopic sections are necessary to enable the machine to travel far enough back, to place the section being transferred up against face of the cut. In absence of the 10 ft. track sections, the two 26 ft. sections can be used as referred to on pages 16 and 17.

The "*American*" can work economically in a cut having a 2 ft. or even lighter face, because of its full-circle action and its ability to work at all times without use of out-riggers of any kind.

Working Against a Heavy Face

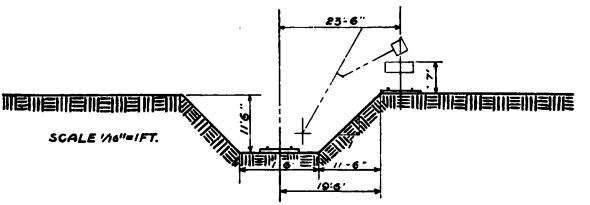
The "*American*" here again demonstrates its flexibility of performance and superiority over the steam shovel on account of the "full-circle" swing, which enables it to take the material from the face of cut and deposit in cars or wagons directly in the rear. The steam shovel cannot do this because its boom only swings half a circle.

The "*American*" will dump higher and at a greater distance from the track than the ordinary steam shovel.

The steam shovel cannot load into cars up on the bank alongside, and make greater than a 5 ft. cut.

With the "*American*" on center grade line, the maximum cut that can be made, loading material into dump wagons or cars 7 ft. above surface rail, up on the bank, is:

Depth of cut 11 ft. 6 in.
Width at bottom, 16 ft.
Slopes, 1 to 1.



"American" Ditcher Digging Cut 11'-6" Deep, and Loading Into Dump Car or Wagon on Bank.

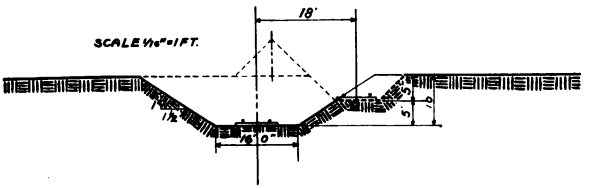
In making a heavy cut requiring more than one trip through on different levels, the steam shovel must be "moved back" to commence a new cut, and be "turned around" before it starts back, because it only digs in front; but the "*American*" "digs back," because it digs and works either way.

The steam shovel only digs down to its track level; it has to "dig ahead" and run ahead. The "*American*" readily digs to 8 ft. 4 in. below level of track on which it stands, and dumps with equal facility in all directions in a 60 ft. circle, either "coming or going."

Suppose you have a cut 10 ft. deep and 16 ft. wide at bottom to make, with steel laid up to the cut, the material is desired for a fill or ballast, and

you would like to handle it in material cars of good capacity propelled by locomotive:

Place the "*American*" 18 feet to either side of grade center, on a level 5 ft. above grade, cutting down to level on which machine is working, wasting material to center for later use, or casting over onto the bank



"American" on One Side of Grade Level Digging Cut 5'5" Deep and Wasting to Center or Casting Over

if not wanted. Then lay temporary track through the cut just made and complete the cut by running the "*American*" back through on center line on the grade level, loading into material cars up on the temporary track just laid.

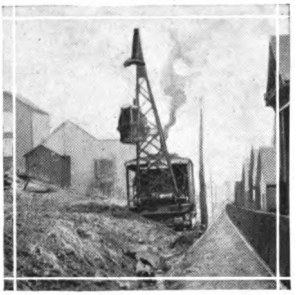
When the cut is reduced to 5 ft. above grade level, the work train can get over to take material for construction, and the "*American*" can, if desired, go ahead, returning any time later to reduce the cut to grade level.

General Remarks

The weight of material from the large capacity dippers on ordinary shovels often seriously damages material cars.

This is not true with the smaller dipper on the "*American,*" but the "*American*" works so fast that the maximum yardage handled compares very favorably with shovels of much larger rated capacities.

A northern road discharged 40 laborers the morning their "*American*" Ditcher arrived. The material was hard packed sand and clay, every shovelful of which had to be loosened up with picks before the men could touch it with their little shovels. The



Ditcher Making a Side Hill Cut

"*American*" dug right through and saved fully $1,000.00 in expense in building a fraction over a mile of grade, aside from eliminating the bother of having to "board and bunk," "hire and fire," the laborers, keep up their tools, etc.

If the cut is on a side-hill, its depth is no objection, as the material can all be cast over if not required for fills or ballast.

If short track sections have not been provided, the regular 26 ft. sections can be used in the following manner: Remove one pair of the bridle or separator rods from end of the wide gauge section. In commencing this operation the machine may stand on either the wide or the narrow gauge section, but must stand on section nearest face of the cut, which leaves the other section free. The free section is lifted by hooking the lifting chain provided for that purpose about midway of the boom, to the bridle chain on the rail section, and raising the boom. The machine then travels backward toward face of the cut, until the two rail sections telescope as far as they will, letting them lap about 9 ft. The machine then travels away from face of the cut onto the section it just moved up, and leaves the rail section free on which it had stood. The boom is turned around toward the face of cut, and the rail section in that direction is moved up to the face of cut, leaving about 12 inches

Making a Difficult Side Hill Cut

Making a Cut

of lap at intersection of the rails. This move can be made in 3 minutes, and 9 ft. dug into face of the bank at each move.

Special ties, 4 in. thick, 12 in. wide and 9 ft. long often serve better than regulation 6x8x 8 ties. To the merit of decreased weight they add broader bearing surface.

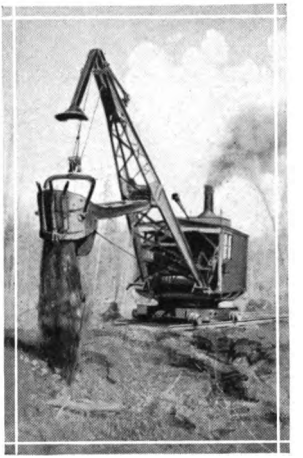
Suppose you are working on a steep side hill cut, and a pole, tree or other obstruction prevents your turning the machine to transfer the rear track section. Do you "get stuck"? Certainly not! With the separator rods removed from wide track section as just described, travel back to rear end of section on which machine is standing. Then run a chain from the ash pan door frame, where it is easy to fasten the chain, to the rear track section, and pull the latter forward until the two sections telescope 9 ft. Then travel back onto the rear section, pick up the front section with the machine and move it up to face of cut.

It takes a mighty difficult situation to "stump" the "American" Railroad Ditcher. It works easily and economically where expensive special machines fail completely.

Its flexibility of performance enables it to reach situations inaccessible to the heavier and more unwieldy special machinery.

A Steep Side Hill Cut

Grading—Making Fills



Making a Fill

Digging From Sides and Dumping in Front

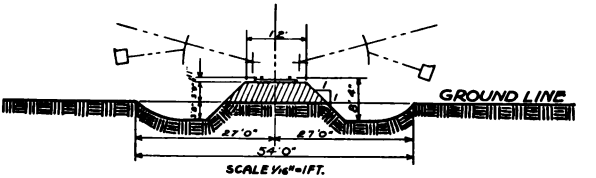
Crew line-up, same as in making cuts:

One operator for "*American*" Ditcher.

One fireman for "*American*" Ditcher.

Two laborers.

One man and team. The machine digs readily to a maximum depth of 8 ft. 4 in. below the rails on which it stands, and to a maximum width of 30 ft. from center of track. Working on the center grade line it easily digs sufficient dirt from the



"American" Ditcher Digging Below Rails and Building Fill 3' 9" High With Material Taken From Sides.

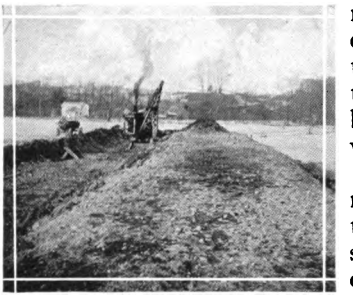
sides and deposits it in front as it goes, to make the following fill:

Depth of fill, 3 ft. 9 in.

Width at top, 12 ft.

Slopes, 1 to 1.

The two 100 lb. 26 ft. portable track sections serve admirably in this situation as they give the machine a good long solid working base on the



Down on Side of Grade Making a Fill

new grade. It is more common to spike ties to the rails in this operation than in making cuts because the machine is working on fresh grade.

The degree of firmness of the material determines whether ties should be used. When only a few are required they are often used without spiking. Loose ties are either carried from rear to front by the laborers, or piled on the dipper and conveyed around by the machine.

The weight of the material falling from the dipper, and the weight of the machine passing over on the portable track sections, pack and settle the grade.

Machine Down on Berm on Side and Depositing Material Up on the Grade

This is very easily accomplished by the "*American*" for four reasons:

(1) The facility with which the machine travels up or down a grade on the portable track sections.

(2) The maximum clearance height and reach of the dipper above the track on which the machine operates, as follows:

With radius of dipper, 29 ft.
Dumping height above rail, 9 ft. 4 in.

With radius of dipper, 22 ft. 10 in.
Dumping height above rail, 18 ft. 8 in.

(3) The maximum digging depth of 8 ft. 4 in. below track and maximum digging radius of 30 ft. 6 in. insures obtaining greatest amount of material at each setting.

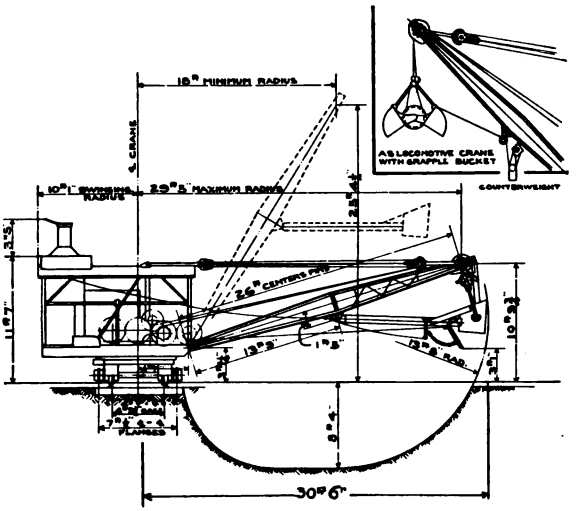
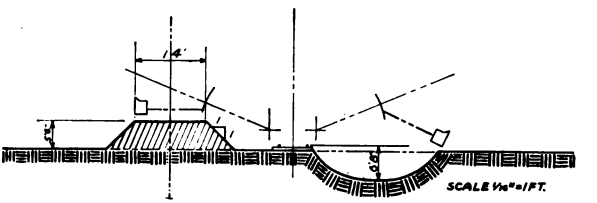


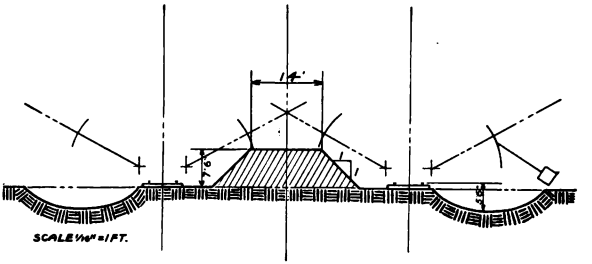
Diagram of Maximum and Minimum Digging Radius

(4) Free moving, full circle action of the "*American*" without use of "outriggers" of any kind.



"American" Ditcher on Berm, Building 5'-6" Fill With Material Taken From One Side.

For fills over 3½ ft. to 4 ft. it is advisable to work the machine down on side of the fill and deposit material up on the grade.



"American" Ditcher, on Berm, Building 7 '-6" Fill. Material Taken From Both Sides.

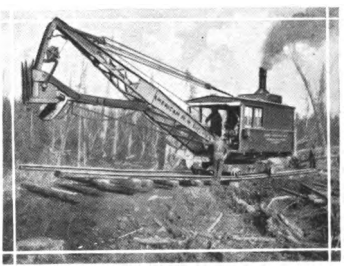
Taking material from one side or borrowing from one side only, enough can be obtained to make the following fill:

Depth of fill, 5 ft. 6 in.
Width at top, 14 ft.
Slopes, 1 to 1.

Taking the material from both sides of the roadbed, it will make the following:

Depth of fill, 7 ft. 6 in.
Width at top, 14 ft.
Slopes, 1 to 1.

When rock formation or other obstacles prevent borrowing sufficient material from the sides, a grade can be completed just wide enough to lay the track, and ballast or material can be brought in later with work train to complete the fill. In such situations the machine may be able to make the fill up to grade line but not to full width, and the shoulders may be flushed out later.



Digging from Sides, Dumping in Center

General Remarks

Convict Labor Making a Fill

For "Scratch work" or where there are small, short stumps, many deem it advisable to lay out the grades to provide for a 1½ ft. fill throughout, covering up the boulders and many stumps. The track has to be ballasted anyway, and the ballast makes part of the fill. Powder is saved, danger from blasting is eliminated and better results are obtained in the completed road, after it settles, by having the slight fill.

To do this would require about 100 yds. of material borrowed from the sides in each station of 100 feet.

With a crew of hand shovelers, this costs from 15c to 20c per yard, or approximately $22.00 per station of 100 ft. with no allowance for powder. The "*American*" easily displaces from 15 to 20 men in this work.

The "*American*" does this work at a cost of approximately $6.00 per station, allowing liberally for interest and depreciation, and for 15 to 20 lbs. of powder to loosen up the stumps. It will easily cover from 3 to 4 stations of 100 ft. in a day. Hand grubbing requires about twice as much powder.

Doing this work in the ordinary way, by hand, it is not uncommon to avoid the cuts because the dirt cannot be disposed of, and the low places are "corduroyed"; especially on logging roads, because the material can be had only at prohibitive cost. Detours are common, with increased mileage, to avoid cuts and fills.

Straight Steam Shovel Work

Working in Sand Pit

Crew line-up:

One operator for "*American*" Ditcher.

One fireman for "*American*" Ditcher.

One laborer.

One man and team.

Ballast or a fill may call for a certain kind of material, or more than can be obtained by the machine from sides of the grade. If there is no track to the material, the "*American*" will travel quickly to it on the portable track sections.

The full circle design, with means for rapid manipulation, give the "*American*" greater capacity than steam shovels much higher rated.

Loading Into Dump Wagons

If it is not convenient for wagons to come alongside of machine, the full circle action of the "*American*" permits loading wagons at rear of machine, or any other point in the circle of 60 feet.

The maximum dumping height and reach of the "*American*" make it possible to place material in wagons up on bank, which steam shovel could not do.

The size of the dipper is such that weight of the material falling into the wagons does not injure them, as sometimes happens with steam shovels using a larger dipper.

Working Against Light Face

Loading Into Material Cars or Onto Flat Cars

If there is track to the material you can

Loading Onto Flat Cars

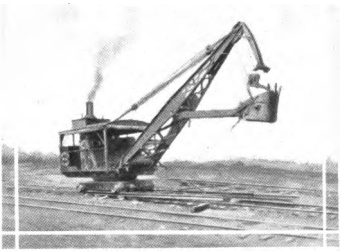
run the "*American*" to it on the auxiliary standard gauge truck wheels, or you can run it up onto a flat car under its own power, and take it to the material with a locomotive. If side track is provided the "*American*" will work from top of the flat and load cars on the main line; it can be run down onto the side track on its auxiliary standard gauge wheels, and load cars on main line.

If there is no side track, the "*American*" can be set out on the side the same as a steam shovel. Temporary track can be laid, or the portable track sections can be used.

General Remarks

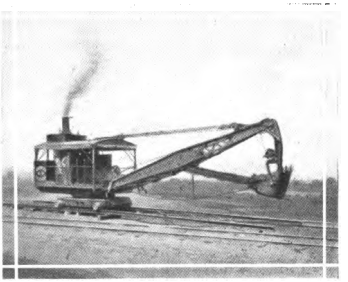
The "*American*" may be down on the standard gauge surface track, and be very speedily and easily set out onto the portable rail or track sections, without cutting or molesting the permanent track.

To do this, first remove ties from the widest of the portable track sections if there are any spiked to it, and place the rails so the chamfered ends rest lightly under the widest tread of the double-flanged wheels. Let this track section bear off slightly to the right or left, in the direction the machine is to go, resting on the permanent rail at the machine and being blocked up at the outer end to make solid. As machine mounts the track section, one rail will be directly under the double tread wheel on one side, and the rail on opposite side will be 8 or 10 inches from the truck wheel. This will throw the end of



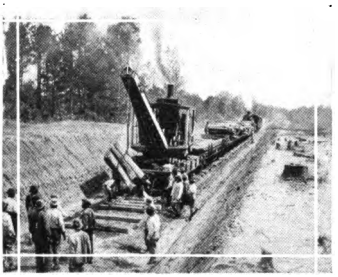
Beginning to Mount Portable Track Section

section farthest from machine about 2 ft. to the right or left of a line parallel with the surface track. The double tread wheels being 2 inches above the permanent track level, are high enough to mount the chamfered ends of the portable rails. Now turn the shovel or boom end of machine around in the opposite direction from which you wish to travel, picking up a shovelful of earth, if convenient. This additional weight tends to make opposite end of machine lighter so it will easily mount the portable track section. Throw the travelling gear in lightly and the wheels in contact with portable track section will quickly mount same. Now turn boom around in direction in which machine is to travel, which makes the rear end lighter, and the wheels under the rear of machine will mount the track section, and the standard gauge wheels are clear of the surface track. The narrow gauge portable track section is then put into position at end of the wide gauge section, and by means of the chamfered ends of rails where they telescope, the turn to right or left may be very pronounced until the machine is entirely clear of the permanent track. This operation is reversed when the machine is placed back on the standard gauge track.



Leaving Main Track on Portable Sections

Laying Track



Handling Ties To Crew

Laying Track on Completed Grade

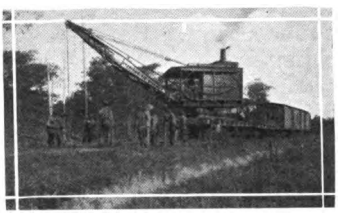
Crew line-up:

One operator for "*American*" Ditcher.
One foreman for "*American*" Ditcher.
Two men on tie cars.
One tong runner on rail car.
Eight spike drivers.
One spike peddler.
Four nippermen. Usual work train crew.

The average capacity of the "*American*" as a track laying machine is approximately two-thirds of a mile per day. In many instances, the crew listed above has laid, day after day, 3,250 feet in a day of nine hours.

General Remarks

Suppose there is a given amount of completed grade, or that the "*American*" has proven itself so valuable (as has been true in many cases) that it is easy to find profitable work for more than one. One machine is presumably busy ahead building grade, driving piles, building bridges or doing something else. The other "*American*" is put into a work train of one locomotive and four flat cars, made up as follows: First, the "*American*" headed in on a flat. A car of steel (100 to 125 rails to the car) is placed next to car on which the machine stands; behind the steel are two cars of ties.



Handling Steel To Track Laying Crew

Laying Track Fast and Ecoromically

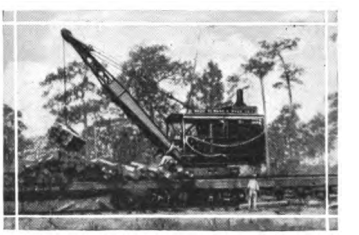
The locomotive spots the train as the track is laid, and brings in additional material.

The ties are piled in bundles of 16 or 18, sufficient to lay one 30 ft. panel of track. A chain is hooked around the ties, which are quickly dragged over tops of cars, or along the sides of the cars on the grade, to where a straight lift can be obtained, then swung around and dropped into place on the grade or trestle. Two men on tie cars keep the ties piled up ready for machine to take away. The tong runner hooks tongs onto the rail, and passes the chain back to men on the tie cars. The machine then swings around, picks up a rail, and slewing around to the front, deposits it on the grade.

Spikes, bolts and angle bars are carried on car with the machine.

An analysis of laying 3,250 feet of track on completed grade in nine hours with the *"American"* is interesting. The items are as follows:

This length of track involves the laying of 108 sections or panels of complete track, each 30 feet, or rail length, long. This means 216 rails, 214 pairs of angle bars, 856 track bolts, 1,944 track ties and 7,776 spikes. Nine hours are equal to 540 minutes. Laying 108 rail-length sections in that time allows just five minutes for each. This allows the two men on the tie car four and one-half minutes to pile the 16 or 18 ties which



Distributing Ties

Laying Track the "American" Way

go into each rail length and one-half minute to hook the chain. The man on the rail car has five minutes in which to do his work and pull the chain back for the tie man. His work is simply attaching the tongs to the two rails which go onto each section of track and perhaps guide them somewhat as they start to swing. Located as he is, between the machine and the tie cars, he is in position to pass the chain to the latter.

The spikers and nippers have five minutes in which to distribute eighteen ties, place rails and angle bars, and do all the necessary spiking and bolting; in fact, all of the work that is necessary to be done before the machine and work train can be moved forward. It should be remembered that there are twelve men in this part of the crew—eight spikers and four nippers. Five minutes also are available to the spike peddler for carrying seventy-two spikes, two pairs of angle bars and eight bolts, not over 40 feet from the machine car, and distributing them where they are wanted.

Large southern contractors purchased an *"American"* Railroad Ditcher, almost exclusively for track

laying, and their experience, in substance, is as follows:

"The '*American*' has relieved us greatly by reducing size of our crew and increasing results when men were scarce and unreliable.

"The '*American*' has paid for itself and saved a large sum of money in addition, in a comparatively short time. We would not take $10,000.00 for it if we could not get another.

"We carry out a train load of material in the morning and have same amount brought out after dinner, lay that and go back to the material yards to load up for the next day. This gives us 7½ hours actual working time in which we average about 2,600 feet.

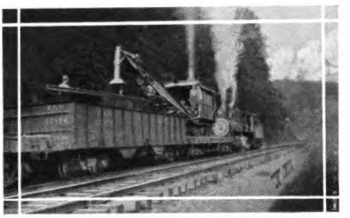
"We have repeatedly laid 400 ft. in one hour, and could lay 3,600 ft. in 10 hrs. if our ties came on flat cars instead of in box cars.

"Before we purchased the '*American*' we used a hand crew of 15 men with a work train and laid 1,000 to 1,200 ft. of track at a cost of approximately $45.00 per day. We have increased the expense about 25% and trebled our results."

To further compare cost of laying track by all hand crew and with the "*American*": Good authority states that with a completed grade and work train, a good steel laying crew of 15 to 20 men should, under the most favorable conditions, lay by hand from 1,500 to 2,000 ft. of track in 10 hrs. at a total expense of approximately $1.10 per 30 ft. track length, or $75.00 per day. The "*American*" at about the same outlay, including all wages and work train expense, easily lays more than twice as much track.

When laying track on up grades, climate and weather conditions materially affect the all hand crew, but do not seriously hinder or retard the "*American.*"

Railroads figure that more work per dollar can be obtained from hand crew track laying in May and June than any other months of the year. This



Handling Rails From Gondola

is because the weather is good, the temperature is such that men can work in comfort and the men have not been affected by the tendency to change their jobs and ask for higher pay, which restless stage always comes with hot weather.

The "*American*" is especially practical and available in extending track over low, marshy right-of-way, through timber where no swamping or road work has been done, where a large hand crew could not work to advantage, or where it is necessary to first lay timbers to get the track over the right-of-way.

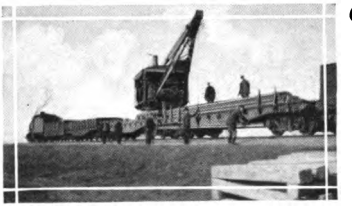
If steel is laid up to the machine, the "*American*" can in an emergency go back up the line and bring down a car of steel or ties. It travels approximately 2½ miles an hour on the auxiliary standard gauge wheels, and if a locomotive can not be furnished when required it serves as a temporary substitute.

This emergency work is often done before or after working hours, and the regular routine is not interfered with.

The "*American*" has, when operating on standard gauge track, pulled 2 standard flats loaded with ties and steel, and 3 boarding cars, up a three per cent grade.

Track laying is merely one of the many "Auxiliary Uses" of the "*American.*"

Rail Relaying



Handling Rails

Crew line-up:

One operator for "*American*" Ditcher.

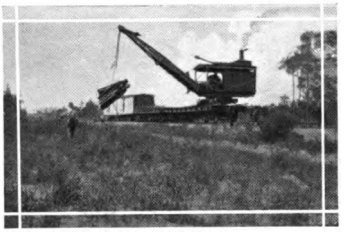
One fireman for "*American*" Ditcher.

Five laborers.

Unloading and Placing Rails on the Grade

The rails to be unloaded may be placed either on flats or in gondola cars. As much or as little material may be taken out with the work train as desired. Take out enough, if possible, in the morning to last all day, say 8 to 10 cars. Place flat car with the "*American*" thereon, midway of the train, and have the locomotive head end toward the train so engineer can more readily see the signals for spotting as the rails are unloaded. The two cars next to car on which machine sets are first unloaded, when the empties are cut out. The "*American*" can travel over the flat cars on the portable track sections, but not to the best advantage in this work with the track sections used for right-of-way ditching. In ditching it makes no difference where the rails lap, as the dirt may be deposited any place on the car, but in traveling up to next carload of rails, the portable track sections cannot rest upon rails on the loaded car ahead. To avoid this it would be advisable to provide track sections of proper length so that they would not extend over onto the car ahead. The empties can usually be cut out when at a switch clearing for train service, or when going in for meals, with little if any sacrifice of time.

Place three laborers on the car of rails. One laborer, known as "Tongsman," sets rail tongs at the approximate center of rails. Put one man on each



Swinging Bundle of Ties Onto Grade

end of the car. One should be provided with a rail fork and the other with a short pinchbar to place the rails "ball up" to accommodate hooking on the rail tongs. The two end men steady the rail as it goes over the car. The remaining two laborers are placed on the ground, one on each side of rail car, to unhook the rail tongs and assist in spotting end of rail even with end of last rail unloaded. Unload a rail first on one side and then on the other.

The engineer spots the train on flag signal from the brakeman, who stands on the machine, or on the machine car. After the crew gets accustomed to the work, several rails may be unloaded without stopping the train, and the new rails can be spotted so that very little shifting is necessary by the track laying crew, when they later lay the new steel.

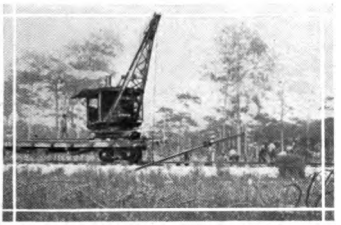
It is advisable to mark each car indicating approximate rail centers, so the tongs can be quickly hooked at center, and reduce teetering of rails.

The dipper and arm can be removed in 30 minutes. This is recommended for extensive work. The hoisting line, which reaches to a maximum of 29 ft. 8 in. from center of machine, easily extends the boom point to center of a 40 ft. car.

The dipper need not be removed where the amount of work is limited, but rail cannot be handled so quickly because the hoisting line is doubled, which reduces the speed by half. If the dipper is not removed, a $\frac{3}{8}$ inch chain 6 feet long should be provided, with a ring on one end. Pass ring over center dipper tooth and fasten rail tong to the other end of the $\frac{3}{8}$ inch chain with a 3 ft. bridle chain.

Bolts, spikes and angle bars may be carried on car with machine.

General Remarks



Placing Rails On Grade

The "*American*" with this line-up will unload two rails a minute, averaging 90 rails an hour.

There is no crimping of the steel or damage to ballast berm by this method, which cannot be avoided with the all hand crew. There are no men hurt. Some wrecks have been traced to rails injured when thrown from cars by hand crew,—especially when unloaded from gondola cars. Gondolas and flat cars look alike to the "*American.*"

A hand crew of 25 to 30 men is required to unload 90 lb. to 100 lb. steel. The heavier the steel the less they do, but the "*American*" handles a 100 lb. rail as easily as a 60 lb. There is confusion in all hand work because of the number of men required; the work is done with much less snap and precision than the "*American*" way, and the all hand crew accomplishes much less in results at much greater cost. The "*American*" eliminates the necessity of keeping up the bunk cars and feeding the big hand crew.

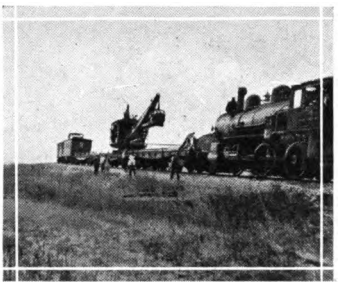
A hand crew of 30 men on a Western Trunk Line averaged 50 rails per hour or 500 in a day. The "*American*" with the machine crew and 5 laborers in the same work, averaged 90 rails per hour, 900 per day and saved over $40 per day.

Handling Rails From Gondola

Loading Old Rails

Crew line-up:

One operator for "*American*" Ditcher.
One fireman for "*American*" Ditcher.
Four laborers.



Picking Up Old Rails

The usual custom is to pick up rails from one side of the train at a time. Provide two men on the ground alongside the car to be loaded. One of them clamps the rail tongs on the rail center, and the other holds end of the rail to guide it as Ditcher boom is swung to position over the car. Two men on the car, one at each end of the rail, guide it into place. The man on the ground, whose duty it is to guide the rail, throws angle bars and bolts on the car. Another laborer can often be used to advantage ahead of the work train marking rail centers and turning rails ball up. The train is spotted on signal from brakeman as in unloading rails.

General Remarks

A prominent Southwestern road showed the following saving in loading old rails after extensive relaying:

	Per rail	Per ton
With hand crew	11.6c	26.2c
With the "*American*"	7.3c	16.5c
The "*American*" saved	4.3c	9.7c

This did not include expense of work train, which is a constant factor by either method of handling

rails, and which may, therefore, be eliminated in comparing cost of the two methods.

A Northwestern road that has 3 "*Americans*" obtained excellent results loading old rails, as follows:

Average number cars loaded per day	5
Number rails per car	120
Weight of steel per yard (Pounds)	60
Total gross tonnage per day	160
Average cost per ton, including work train	32c
Average cost per ton, including loading expense only	10.4c

This was main line work with heavy train service. A large number of the rails were picked up out of water, from behind telegraph poles and pulled up high grades.

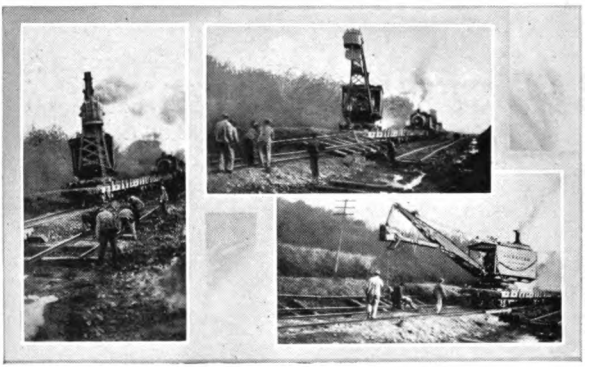
For extensive main line work some roads equip the flat cars with board sides; one car for scrap, tie plates, bolts, nuts, etc., one for good second hand tie plates, and one for angle bars, in addition to the rail cars.

In heavy work of this kind some roads have four men go ahead of the train to classify and assemble the small material into piles, so that the four other laborers can quickly load it onto the respective cars.

There may be different orders for loading. For instance: One order may call for 30 ft. rails in good condition, with or without angle bars, on the same car, another for so many lineal feet regardless of rail lengths, another for curve worn rail, another for short lengths, etc.

When time is lost clearing for main line trains the time may be utilized by having the men sort and pile material and scrap on the cars, mark rail centers, break joints on old rails, and classify material in advance of the train.

Shifting Track



"American" Shifting Track

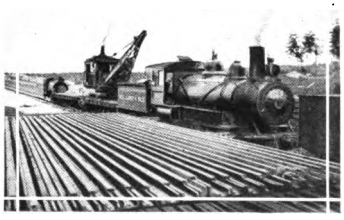
Crew line-up:

One operator for "*American*" Ditcher.
One fireman.
Five or six laborers.
Usual train crew.

The "*American*" is headed in on a flat so it can work from front end of the car. After the angle bars have been removed, it is an easy matter to lift a section of track, steel, ties and all, with the hoisting line, and shift to either side as desired. A direct side pull may be obtained by running the hoisting line through a snatch block fastened to a post or "dead man" of some kind.

While shifting track is not an operation that is frequently performed, there are occasions, such as in readjusting yards, when it is desirable to shift the track in sections rather than by tearing it up and relaying in the customary way. On such occasions the "*American*" very quickly demonstrates its adaptability, transferring the heavy sections speedily and economically.

Loading and Unloading Material



Ditcher Loading Rails

The "*American*" can be taken into the material yard with the empties, load the material quickly and cheaply, and go back to end of the steel with the work train.

Handling Rails

In handling steel, depending upon conditions as to climate, weather, ground level, location of rails to track, etc., the "*American*" and 5 to 8 men will displace an all hand crew of 25 to 30 laborers.

The "*American*" will easily unload from cars to stock pile, 10 cars of 100 rails each (1000 rails) in 10 hours, at a cost for machine expense and labor, of $15.00; actual cost of handling rails less than 3c per ton. It has, on a test, unloaded 100-100 lb. rails to stock pile in 45 minutes at a cost of $1.13.

General Remarks

(1) The "*American*" handles 100 lb. rail as easily as 30 lb., while the heavier the steel the less the hand crew accomplishes.

(2) The "*American*" loads into a gondola as easily as onto a flat, and it is next to impossible for men to load into a gondola.

(3) The "*American*" lays the rail down easily, and the men "drop it." The day for dropping rails has passed.

Ditcher Handling Ties

(4) The "*American*" does not injure the ballast berm, and

Loading Old Material

a crew of men damages it badly at times.

(5) The "*American*" pulls in rails from a distance and from locations that would be impossible for a hand crew.

Handling Ties

In loading or unloading ties, the "*American*" and a crew of 5 or 6 men will easily do the work of a hand crew of 25 or 30 men. The "*American*" commences at one end of the train of flats, traveling over them on the portable track sections, loading the ties or other materialas it goes. It pulls in the material from a distance and lifts it out of hollows, etc.

One prominent Southern road with several "*American*" Ditchers purchased another "*American*" and flat car equipment for exclusive use in loading ties over the system and unloading them at their creosoting plants.

Clean-Up Train

A Western road has used one of their "*Americans*" exclusively in this capacity for 5 or 6 years, picking up old material along the right-of-way and unloading it at their material yards. Machine crew consisted of one operator and four laborers, the operator usually doing his firing.

Old rails, bridge timber and heavy parts that would require a hand crew of 20 to 25 men were readily handled by the "*American.*"

The "Scrapping Up" Train

Pile Driving, Bridge and Trestle Building

Putting On and Removing the Pile Driver Attachment

In bridge and trestle building the shovel is removed to facilitate the handling of timbers, piles, etc., and to enable the Pile Driver attachment to be applied.

The Standard Pile Driver attachment consists of a pair of 30 ft. wooden leads with steel guides, suspended from point of the boom. Leads are attached to the revolving deck by means of substantial channel irons with latticed bracing, which form the base for a platform. The leads may be readily moved sidewise and bolted into position for driving batter piles. Standard drop hammer weighs 1500 lbs.

40 ft. leads and 2000 lb. hammer can be furnished at slightly increased price.

The "*American*" drives straight or batter piles at any point in a 40 ft. circle, or at a maximum radius of 20 ft. from center of machine. This permits driving pile bents directly in front having approximately 15 ft. centers.

Pile Driving

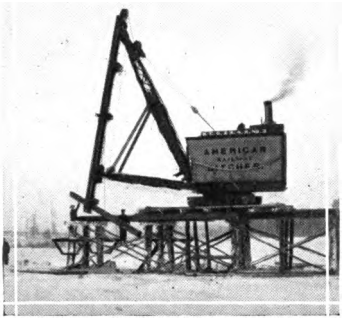
Crew line-up:

One operator for "*American*" Ditcher.
One fireman and handy man on the machine.
One foreman or boss carpenter.
Three helpers.
One team and teamster.

The team and teamster snake or bring in piles and timbers, and provide coal and water. If working over a stream the tank is filled with siphon provided with the machine.

Pulling Piles Into Leads

The pull-back, or front drum, which in shovel work, handles a line that pulls dipper back to where it is desired to start digging, serves admirably for



Swinging Pile Into Leads

pulling piles into leads. It holds ample amount of line for snaking and pulling piles in from a distance, pulling them into the leads, or placing pile-caps and stringers.

Driving Piles

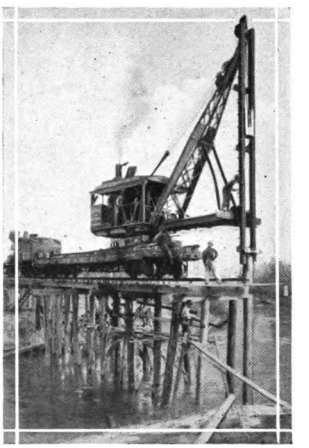
The actual driving of a pile is a matter of routine and need not be detailed. The hoisting line that pulls the dipper into the bank in shovel work, raises the drop hammer.

The boiler and engine are ample in capacity for operating the drop hammer very efficiently.

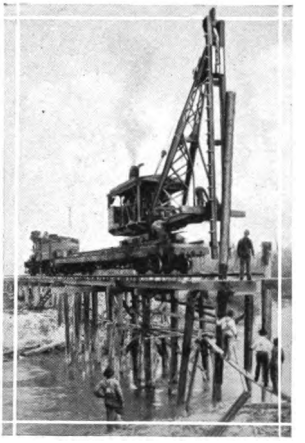
The machine strikes 8 to 10 blows of the hammer per minute, with an average drop of 20 feet.

Placing Caps, Stringers and Ties

If the track is laid up to the machine, this material is carried on either flat or "larry" cars in the rear, from which place it may be transferred to the front with the machine, or by hand, as conditions warrant. This material may be brought up to the machine on wagons.



Ditcher Driving Piles



Lifting Pile Into Position

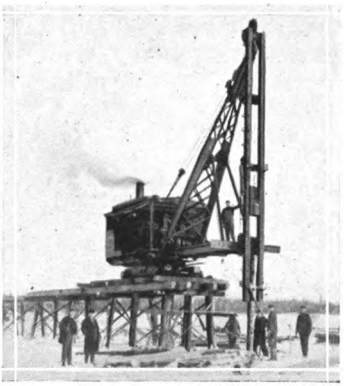
General Remarks

The usual method in pile driving is to mount the machine on a flat car headed into the work, spotting the car with a locomotive as the bridge is completed and the track laid. Flat cars back of the machine car carry the piling, caps, stringers and track material.

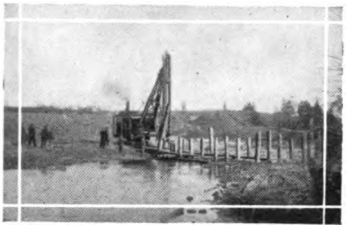
A plan followed by many operators is to put the machine down on grade line on the surface track in starting the bridge, bringing the caps, stringers and other material down to machine on "larry" cars.

Use two 12 to 15 ft. sections of wide gauge portable track with ties spiked on. The sections are raised with the line from pull-back drum, the track section straddling the leads when it is transferred.

Lay stringers on caps over the bent just completed, and when machine travels out onto same everything is clear for the next bent. In this manner bents can be driven with an approximate maximum distance of 15 ft. from



Hard at It



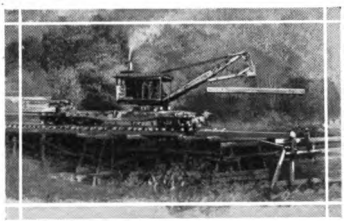
Driving Piling from Ground Level

center to center. Temporary stringers can be used to carry machine over the piling, the permanent stringers, ties and steel laid later in regular manner, while the "*American*" is busy farther out on the line.

One case called to our attention was a 340 ft. temporary trestle to be filled in. It was built of 3 pile bents, the two outside piles driven at a batter and 8x8 caps used. The trestle was 10 to 16 ft. high, piles 16 to 24 ft. long. The machine was down on the grade line on 12 ft. portable track sections, traveling over the trestle on temporary stringers as completed. They averaged 8 to 9-12 ft. bents, or 100 ft. of completed trestle per day. The piles were all provided from "dead heads" and "sinkers" which the "*American*" fished out of the river. They used 70 lb. steel for temporary stringers, underneath regular ties, and 70 lb. steel to pass the material cars over to build up the grade, pulling the temporary steel stringers out and lining up the track when fill reached sub-grade. They thereby saved expense of permanent stringers. The cost of caps, nails, and labor was $3.75 per bent.

Many large roads save the cost of this attachment several times over in caring for one emergency, and it is entirely ample for every requirement of the smaller road.

Building or Razing Timber Bridges or Overhead Structures



Ditcher Building Timber Bridge

The pile driver and shovel attachments are taken off for this class of work. The machine then becomes a locomotive crane of nominal 5 tons capacity.

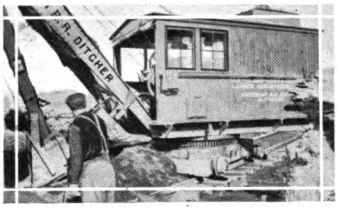
The machine works from the top of a flat car headed into the work by a work train. If building a bridge, the material is carried on flat cars back of the machine car, and if razing a bridge or other structure, the material is loaded on empty cars back of the machine car. The machine moves freely back and forth over the flat car on the portable track sections under its own power, and working in a full circle readily handles material from material cars to the front, or from front to the rear. No outriggers are required; clamping down chains are provided for chaining machine to the car when necessary.

Two individually operated friction drums provide two lines that may be handled independently or simultaneously, at the will of the operator.

Where circumstances warrant, the "*American*" can run down onto the surface track on the auxiliary standard gauge wheels for this class of work.

Razing Timber Bridge

Ballasting and Spreading



Ditcher Ballasting Track

Crew line-up:

One operator for "*American*" Ditcher.

One fireman for "*American*" Ditcher.

One laborer.

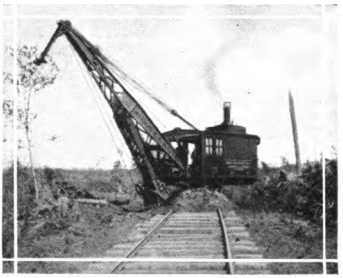
One man and team.

After the track is laid on the new grade, the "*American*" travels over the track on the standard gauge auxiliary truck wheels, digging and spreading the ballast as it goes. The cost of both ballasting and spreading is included in the one operation. The "*American*" digs the material from either side, and places it on the track in front. The one laborer works in front of the machine to remove roots and rocks that might interfere with the machine passing over the material in the act of spreading.

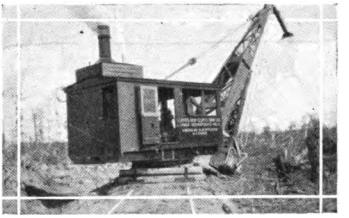
The "*American*" easily ballasts and spreads 2,000 ft. of track in 10 hours at a cost of $1.25 per station of 100 ft., or $25.00 per day, when sufficient material can be obtained from the sides. This estimate includes a liberal amount for upkeep, interest, depreciation, etc.

The maximum digging depth of 8 ft. 4 in. below rail on which machine sets, and maximum digging radius of 30 ft. 6 in. on level with the rail, usually permits obtaining ample material from the sides.

This method eliminates the work train



Spreading Ballast



Showing Type Of Spreader Used

otherwise necessary to provide this material, or the force of at least 20 hand shovelers required to put the dirt under the ties.

Ballasting by hand in "scratch" work costs as much or more than grading, and the greater the fill the more disadvantage the hand crew works under, with proportionate increase in cost.

Ballasting with hand shovelers may easily cost $5.00 per station of 100 ft. or from $200.00 to $300.00 per mile.

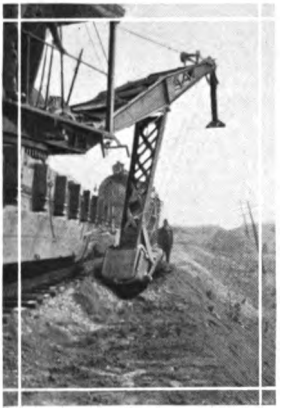
Spreading the material evenly between and over the ties for the surfacing crew is the final act of ballasting.

A home-made spreader is shown in the illustration accompanying. This is made by hooking two pieces of 5/8-in. wrought iron into pockets in either end of the machine truck, bending the iron down toward the rail and back up, providing for dropping in two good cross ties, so that the lower one just clears the rails. This covers all the "low spots," but a more elaborate device of "A" shape could be easily arranged. The spreader can be placed on either end of the machine; it ballasts and spreads in either direction.

It is impossible for sand or dirt to get into the traveling gears of the "*American*," as they are all thoroughly enclosed and run in oil.

The machine pushes the spreader under its own power, spreading the material evenly out to the ends of the ties.

A Southern road used one of their "*Americans*" extensively for flushing the fill, or widening the shoulders of grade, by setting the dipper into the



Widening Shoulders of Grade

material after it had been plowed off, and moving the train forward slowly under signal from the Ditcher operator, as shown in illustration herewith.

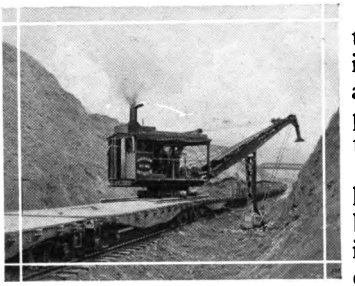
General Remarks

Unfavorable climatic or weather conditions do not handicap the "*American*" as they do the hand crew, and when the work is tied up the outlay is reduced to the minimum.

The "*American*" eliminates horses with their drivers and upkeep; it reduces equipment to a minimum and cuts out many of the causes for worry.

The "*American*" makes a splendid showing in emergencies, or under adverse circumstances where the "hand crew" makes small headway at a big expense. The "*American*" works every minute, rain or shine, making the most of all available time between trains on the main line.

Cut Widening and Removing Slides



Ditcher Widening a Cut

It is often desirable to "put the line through" in the least time possible and get traffic started, putting the finishing touches on later.

Certain cuts may have a tendency to slide badly and cause trouble; it may be desirable to clean them out and make room for snow, or the material may be required for a fill. In widening a cut with the "*American*", a good ditch can be left on the outside of the grade that is impossible to make with the steam shovel, or with the hand crew.

Flat Car Work Train

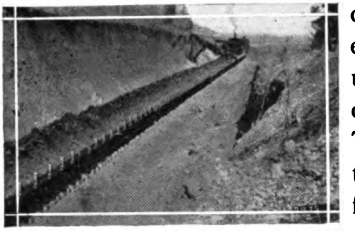
Crew line-up:

One operator for "*American*" Ditcher.
One fireman for "*American*" Ditcher.
One laborer or handy man.

If flat car equipment is used, cars of at least 80,000 lbs. capacity, in good condition, must be furnished. Enough cars should be supplied to enable the "*American*" to load dirt as long as train clearance will permit, or as the length of haul and number of work trains in service suggest.

Cleaning Up a Side

The "*American*" loads a car, travels over on the portable track sections to the next empty flat and pro-



Ditching a Cut

ceeds as before until the entire train is loaded, or until the work train clears for train service. The locomotive "spots" the Ditcher on signal from the Ditcher engineer.

Dump Car Work Train

A custom on many roads is to put the "*American*" on a flat between two 15 to 20 yard material dump cars, load them at the rate of 50 to 60 yards an hour, then pull the train out and dump them.

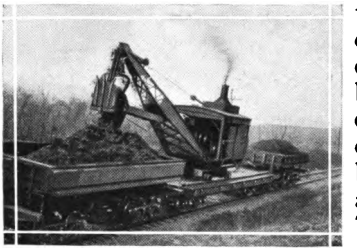
Crew line-up:

One operator for "*American*" Ditcher.
One fireman for "*American*" Ditcher.

Air dump cars are admirable for this service. Some roads put permanent track on the flat car on which the Ditcher stands, instead of using the portable track sections furnished with the machine. Much time is saved with the dump car train over stringing the cable to unload material with an unloading plow, as is customary when using flats. This permits the material to be pulled a much greater distance to unload, get back onto the job, and yet handle more yardage in a given time. The dump car train, being lighter, permits more speed and better time when moving than is possible with the heavier flat car train. It can, therefore, work longer before clearing for trains and show greater yardage in a given time.

The Dump Car Work Train

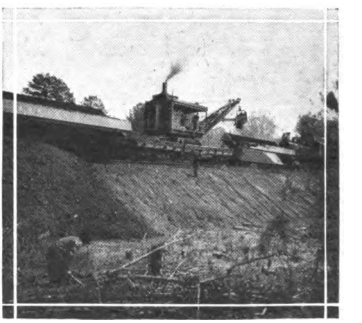
Often the material can be used to advan-



Ditching With a Dump Car Work Train

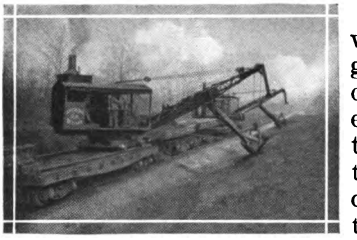
tage to flush out the fill or widen shoulder at the end of the cut that is being ditched. The dump car train can run out and dump and be back at work in the cut again in a few minutes. The flat car train must either run to a switch to set the unloader and string the cable or the material be unloaded by hand. So much time is consumed that regular train service often interferes further with the working time; and as a consequence the material is unloaded any place to get rid of it, often where it is not needed, while the place that does need it is neglected. The dump car train can go out to end of the cut and dump, shoot back into the cut and work until smoke of the train they are to clear for is in sight, then get out of the way.

Here is another saving: A light engine that will pull this train can be used without its being necessary to take a heavier engine from freight sevice that would be required to pull the heavier flat car work train. The machine operating expense is less, as there is no occasion to shift the portable track sections and a laborer is not required to assist in moving them. The machine operator and fireman usually complete the machine and ditching crew. This method might appeal to the new road not yet equipped with flat cars.



Unloading at the Dump

The Double Ditcher Work Train



Double Ditcher Work Train

The double ditcher work train is an outgrowth of the single ditcher train and was evolved on the principle that if the single ditcher train is good a two ditcher train would be twice as good. With this method four dump cars are filled in the same time required by one ditcher to fill two, or double the number of flatcars that would be loaded with one ditcher, yet only one engine and train crew are required.

Cost of Single Ditcher Work Train

2 Automatic Air Dump Cars	$3,500
Freight (est.) on above	250
One 80,000 pound Flat	800
Ditcher	6,000
Freight (est.) on above	250
TOTAL	$10,800

$10,800x2=$21,600 cost of Double Ditcher Work Train.

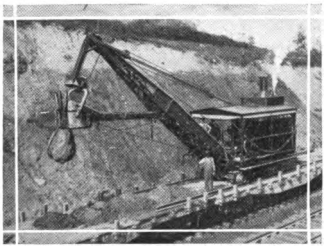
Cost Per Cubic Yard

Single Ditcher Work Train		*Double Ditcher Work Train*	
Int. per day on train at 6%, 312 da.	$2.07	Int. per day on train at 6%, 312 da.	$4.14
Depreciation on Ditcher at 8%	1.54	on two Ditchers	3.08
" Dump Car Train, at 8%	.85	on 4 Dump Cars and 2 flats	1.70
Coal, 1 ton at $2.50, for Ditcher	2.50	Coal for two Ditchers	5.00
Oil, waste, etc., for Ditcher	.50	Oil, waste, etc., 2 Ditchers	1.00
Coal, 2 tons at $2.50, for locomotive	5.00	Coal, for locomotive	5.00
Ditcher engineer at $125 per mo	4.80	2 Ditcher engineers	9.60
Oil, waste, etc., on locomotive	1.00	Oil, waste, etc., on locomotive	1.00
Ditcher fireman at $1.50	1.50	2 Ditcher firemen	3.00
Train conductor	5.00	Train conductor	5.00
2 brakemen at $2.50	5.00	Two brakemen at $2.50	5.00
Locomotive engineer	5.00	Locomotive engineer	5.00
" fireman	1.50	Locomotive fireman	1.50
	$36.26		$50.02
36.26 ÷ 200 yards per day=$.1813, cost per cubic pard with Single Ditcher Work Train.		$50.02 ÷ 400 yards per day=$.12505 cost per cubic yard with Double Ditcher Work Train.	

$.1813—$.12505=$.05625

Thus it will be seen that the Double Ditcher Work Train will do right-of-way ditching at a saving of $.05625 per cubic yard, over the Single Ditcher Work Train.

Removing Slides



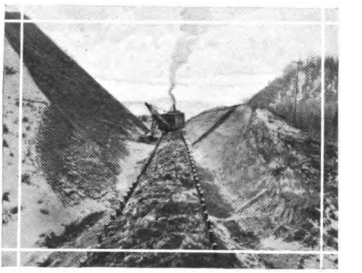
Lifting a Good Sized Boulder

If material covers the track, head the "*American*" into the slide on a flat car, casting over if it is a side-hill cut. If it is a through cut and the material covers the track the "*American*" can pick up the material in front and deposit it either onto a flat or into a dump car in the rear. A dump car serves admirably in this work, as it can be taken out to end of the cut and dumped very quickly and set back to the machine, with very little loss of time.

The maximum digging radius of 30 ft. 6 in. from center of track gives ample room for future slides, without their covering the track.

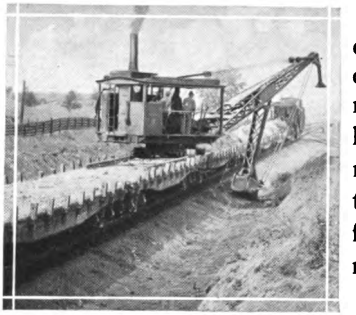
Or the "*American*" will work right into the slide under its own power, on the standard gauge track, casting over as it clears the way. Boulders, trees, snow, water and other obstacles that limit the efficiency of the "hand crew" and their little shovels are sport for the "*American.*"

A narrow gauge, western road purchased an "*American*" on 8-wheel MCB trucks almost exclusively for removing snow slides from cuts. Their rotary snow plow was displaced by the "*American*" because the rocks and boulders kept the rotary out of commission most of the time, but the "*American*" did not mind them in the least.



Cleaning Up a Slide

Right-of-way Ditching



Ditching Right-of-Way

In the design and evolution of this machine, its adaptation to right-of-way ditching has been considered foremost, but this has added to rather than detracted from its usefulness in many other directions.

Flat Car Work Train

Crew line-up:

One operator for "*American*" Ditcher.
One fireman for "*American*" Ditcher.
One or two laborers.

80,000 capacity flats must be provided the same as in widening cuts. Lighter cars may be used to transport the machine from place to place, but they will not stand up under heavy right-of-way ditching.

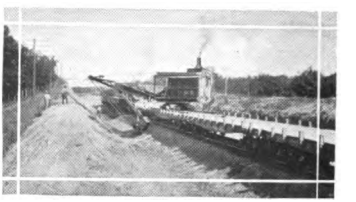
An unloading plow of approved type, with wire cable and steam unloader must be provided, or the dirt can be unloaded by hand. A spreader and leveling car is used in extensive work.

Dump Car Work Train

Crew line-up:

One operator for "*American*" Ditcher.
One fireman for "*American*" Ditcher.

Water for Ditcher can be piped from the locomotive or a water car by using automatic hose couplers between the cars.



Making a Good Ditch

Shifting Portable Track Section

General Remarks

After constructing a road, the "*American*" Railroad Ditcher will always remain an indispensable maintenance machine, ditching the cuts so that the grade will remain high and dry.

The "*American*" displaces from 50 to 150 laborers in ditching right-of-way, reducing the yardage expense for putting material on the car from 20c to $1.50 per yard by the "hand crew" method, to as low as 3c per yard with the "*American.*"

The plunger at boom point forces material through the dipper that will not fall out of its own weight, and avoids use of "choke mouth" type of dipper common on all steam shovels to encourage sticky material to fall out.

When flat car work train is used the "*American*" travels over the cars on the portable track sections, which it rapidly transfers from one car to another, loading the train as it goes.

It will dig any width of ditch required, from a minimum of approximately 3 ft. to a maximum of 23 ft. from end of the ties, digging right up to the end of the ties if desired. It will maintain any width of shoulder or ballast berm required throughout the ditch.

It will dig as shallow a ditch as required or to a maximum depth of 4 ft. 6 in. below the tops of the ties; it will dig on curves as well as on a straight line, maintaining the level or grade of ditch absolutely in line with the surface rail; in finishing a ditch in a cut it will not undercut the slope.

The "*American*" may commence loading from either end of the flat car work train. The machine rests upon one of the portable track sections on the rear end of the first car, with boom toward front end

of car, and with a track section length (approximately 24 ft.) of car toward front end of train, free to take the material to be loaded. The other or second track section lays on the second car to the rear, the rails of the two track sections telescoping about two feet.

Make a pass with the dipper on righthand or operator's side of the car, letting it cut and fill, digging just deep enough to fill nicely. Dump this dipperful at front end of the first track section, without letting the machine travel either forward or back on the car. Slew the boom back around to the right, ready to make the next pass of the dipper, pulling dipper back toward the car by means of the pull-back line through the cut it made in getting the first dipperful. This is easily accomplished without raising the boom, and the next cut will be made on exactly the same grade or level as the first pass of the dipper. As the dipper is pulled back toward the machine to commence the next cut or pass, and the teeth clear the ground surface, let the machine travel forward just enough to permit the dipper to fill as it did before, going into the material directly to the left side, or in front of the pass it just made. The amount of travel on the car in starting dipper into the material will vary from 6 inches to 2 feet, depending upon the length of the pass in the material necessary to fill the dipper; or in other words, how deep the dipper is digging. The pass with the dipper is usually made diagonally to the car instead of at right angles, and the machine will not back away from the work in the heaviest digging unless the operator desires it to do so. Continue digging and dumping as before. When the machine reaches front end of front portable track section, the material already removed will leave an even grade at a depth established in commencing the cut, and the car will be loaded from front end of track section up to front end of the first car. It will then be necessary to propel the machine back onto the second track section and swing the front track section to the

rear, ready to load material on the car where the first section had lain. The locomotive then spots the train on signal from Ditcher operator so that the Ditcher is ready to commence digging right where it left off, and dump material on the flat car in front as before. If the first trip through with Ditcher does not dig down to the grade line of the ditch, continue digging through the cut as above described until grade line or maximum depth of ditch is reached. It is readily seen that fixing the boom at a given height establishes and maintains the desired shoulder line and depth of ditch.

It is advisable to dig and work forward on the right hand or operator's side of the machine, because the operator thereby obtains an unobstructed view of his work. In working on the opposite side of track, the digging is done in the opposite direction of the track from that just described.

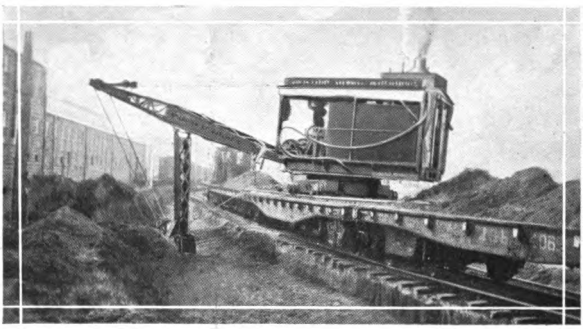
The method with dump cars is the same except transferring portable track sections is eliminated. After filling one dump car, digging from operator's right-hand side of the track, it is advisable to slew the boom around and dig from opposite side of track in filling the second dump car. This is always done in regular right-of-way ditching because the operator gets a better view of the work; however, where side hill work or other conditions make it necessary to dig and load from the operator's left hand side, it can be done.

Grading for Side Track

The necessity of building side tracks is ever present in greater or less degree on all roads. The "*American*" Railroad Ditcher meets this emergency as readily as it does all others.

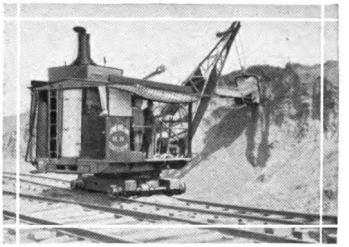
Crew line-up:

One operator for "*American*" Ditcher.
One fireman for "*American*" Ditcher.
One or two laborers.



Grading For Side Track

Suggestions on "Widening Cuts" and "Right-of-way Ditching" will apply to this subject in a general way. Grading for side track will either be making cuts or making fills. Suppose material is to be removed from side of the track to a grade level with main line track, for the purpose of laying a side-track. Put on either a flat-car or dump-car work train with an "*American*" Ditcher, loading material onto the cars and dumping it in the usual way. If a second or third passing track is desired, lay track on the new grade, and after putting the "*American*" and work train on the new track, proceed as before. If working in a side-hill cut and the material is not needed elsewhere, it may be cast over. Material cast over

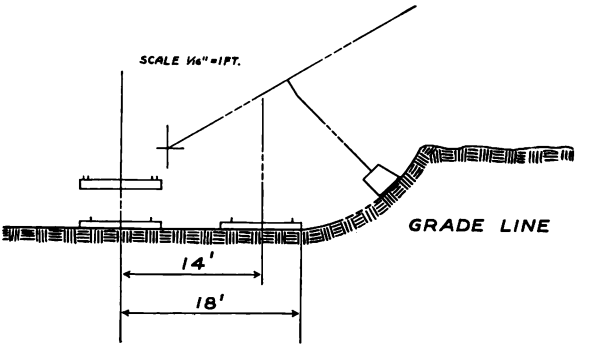


Widening a Cut For Side Track

can often be used to decided advantage in flushing out a grade, or widening it for another track on the outside of main line.

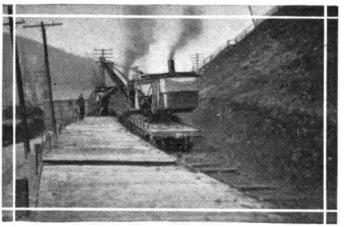
General Remarks

In widening a cut for side-track or for ditching purposes, proceed as follows: If using a flat-car work train locate the "*American*" on the portable track sections on either end of the train, loading the cars exactly as explained under right-of-way ditching. Dump-cars are used as already described.



"American" Ditcher Cutting to Grade Line for Side Track.

Assuming there is a light face to work against at ends of the ties in making the first cut through, raise or lower the boom until the dipper removes material down to grade line. Set the boom at about 65 degrees angle to the front end of car on operator's right-hand side, when the dipper will just clear ends of the ties. Then work through the material as described in "Right-of-way Ditching." This will remove material to grade line 4 ft. 2 in. from ends of the ties. If the



Widening a Side Hill Cut

height of face of the material increases as the machine digs out from the track, it will be necessary to raise the boom and thereby raise the digging radius of dipper in making the next cut through. The boom and digging radius of dipper will be lowered until grade line is reached. The degree of angle to the car and the height at which boom is set after the first cut through depends upon the length of pass necessary to fill the dipper; this is governed by height of face and nature of the material, also by ability of operator. In widening out the cut the boom will finally be turned at right angles to the car, when the dipper will dig to the grade level, without undercutting, approximately 20 ft. from center of track on which machine is working. This provides nicely for laying a side track with a 14-ft. center.

Do not try to dig the material down to grade to the required distance from track center at one setting of the machine, or without moving forward each pass of the dipper. If this is done with flat-car work-train, the material soon accumulates until it runs over sides of car, after which it is necessary for the machine to travel forward to dump the dipper, and travel back to dig where it did before. Aside from this, the dipper fills better if it is allowed to cut and fill gradually in a graceful, even pass, that lets it just clear the slope of the cut, or material, nicely when it is full.

If desired, in widening a cut, the "*American*" can be set down on standard gauge passing track or on its portable track sections, which it transfers itself. I may be either headed into the face of a cut which is at right angles to the track, or take material from cut whose face is parallel to track, and load into material

Down On Standard Gauge Track

cars or onto flat cars on the main track. This method has been fully explained under "Making Cuts" and "Straight Steam Shovel Work."

If a fill is required and the material can be borrowed at the side without interfering with future requirements for more side tracks, observe the following method:

Set the "*American*" down on the side of and at proper distance from the main track, and after borrowing the material, dump it on the new grade next to the main track.

As fully explained under "Making Fills," the "*American*" will dig enough material from one side to make the following fill:

Depth of fill, 5 ft. 6 in.
Width of top, 14 ft.
Slopes, 1 to 1.

The "*American*" here excels the steam shovel, because it can be taken any place, up or down, over dry or wet places, and the steam shovel must be "handled with care" all the time; no outriggers are required with the "*American*;" its great reach and digging depth, with its extreme dumping height at maximum distance, permits its digging and delivering much greater amount of material on the grade than the steam shovel.

The Larger Systems

The "*American*" Railroad Ditcher will pay for itself in actual money saved on many a comparatively small job.

Suppose there is a short extension to make, a siding or industry track to be put in, and it must be done quickly. The "*American*" completes the job in the time ordinarily taken by the contractor in simply getting started.

During the season that "slides" prevail, many division points keep an "*American*" Ditcher ready to steam up quickly and "shoot" out to clean up a slide so traffic need not be delayed. The engineer of a large western road that handles heavy passenger and freight traffic wrote us about an instance of this kind:

> "The '*American*' Ditcher was brought to the place as quickly as possible, and in less than 6 hours the slide was cleared. Undoubtedly it would have taken days to handle it in any other manner. Traffic was only slightly delayed."

One road did so well with its first "*American*" Ditcher in building grade when labor was hard to get at any price, that it installed the second on the other end of the line, noses headed toward each other.

An extra "*American*" Ditcher or two comes in handy on any large system, the same as an additional locomotive or other equipement.

One Southern road has installed 9 "*American*" Railroad Ditchers for both construction and maintenance work in less than 12 months.

One of the large Eastern systems, after trying 2 "*Americans*," purchased 5 more "*Americans*" at one clip.

The Smaller Roads

A Ditcher Work Train

The requirements of the smaller road are just as insistent as those of the larger line, but often less in volume or degree for the individual class of work. An individual Pile Driver, Steam Shovel or Locomotive Crane might be necessary for the requirements of the larger line, while the "*American*" would be perfectly ample for those of the smaller road.

Then why have three times the investment when the "*American*" Railroad Ditcher will do all and more than the three or more separate machines, or why do without having them all at the investment of one?

The "*American*" will build a railroad from "stem to stern" and then maintain it. It is very flexible in its adaptation to the auxiliary uses. It can be run up onto a flat car, if it is on the ground, and shot out at train speed from one operation to another; and when it reaches the next job it is ready to do whatever is required, which cannot be said of the "regular" Pile Driver, Steam Shovel or Locomotive Crane.

But the reduced investment is not the most appealing feature. Things are done quickly and easily, without a lot of extra labor and fussing around.

Think of the number of laborers that it displaces. They are often hard to get at any price. This is not only a satisfaction and saving, but a great relief to many smaller roads that are located a considerable distance from labor markets, and who find it almost impossible to get labor when wanted, at any price.

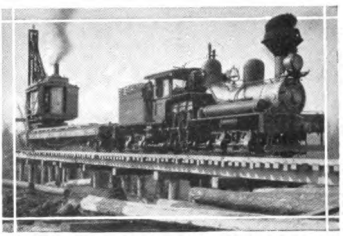
The Logging Road

Ditching Along the Logging Road

If it were possible for the "*American*" to apply or fit into one class of work better than another, it is in a logging operation.

Aside from having more or less main line, logging spurs are being built continuously and there is track to lay and relay. "Driving" the logs to the mill is to a great extent a thing of the past; the log road must go to the logs—they won't come to it. Rough country must be passed over with minimum mileage. Every fraction of a percent increase in maximum grade means increased fuel and greater up-keep cost of train equipment, not overlooking greater danger of derailments and accidents. Going up grade is hard on everything and everybody and going down is dangerous. With an "*American*" on the job, cuts and fills can be made at less ultimate expense.

A Southern logging road recently built a fill 300 ft. long and 4 ft. high, getting all the material from the sides and keeping machine on the grade line.



Driving Piles

For three days it rained almost continuously and they were unable to get their track men to work, but the "*American*" went right on handling dirt. The clay was so soft and

Building the Logging Road

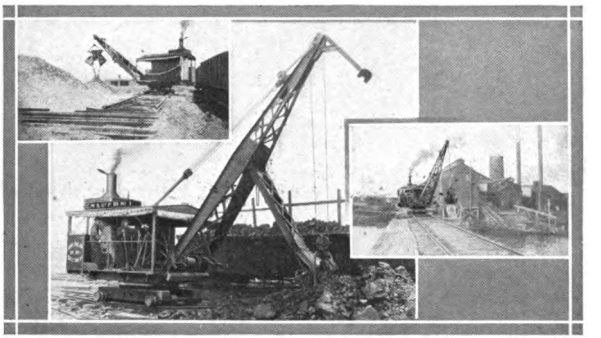
sticky that a hand crew could not have handled it any way. The machine seemed to handle it better than when the material was dry.

There are over 300 "*Americans*" scattered throughout the country loading logs exclusively. This machine can be used with the portable sections on either standard flat cars or logging trucks. (2 sections on flats and 3 sections on logging cars.) It can also be used on permanently railed cars. A special log loading boom and slack accelerator (for feeding the line out to the tongsman) can be furnished at slightly increased cost. This facilitates log loading if it is to be done extensively. However, the dipper and dipper arm can be quickly removed from the boom furnished for standard Ditcher equipment, and other material may be readily handled with the shovel boom.

Nothing approaches the usefulness and efficiency of this machine for "scrapping up" along the right-of-way or for light wrecking. It works freely in a full circle without chaining to the car. Ample provision is made for chaining to the car or track for emergencies or for the heaviest lifts.

The average logging operation does without Locomotive Crane, Steam Shovel and Wrecker, because of the expense, but in the "*American*" they have them all.

The Auxiliary Uses

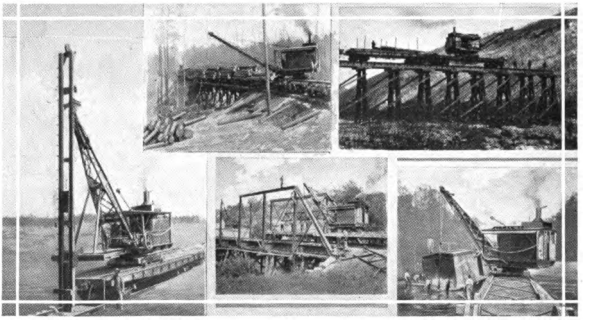


Grab Bucket and Coal Handling Work

Auxiliary means "helping, aiding and assisting." The "*American*" Railroad Ditcher is a past master of a high degree in exemplifying this meaning to the fullest extent on any railroad, logging or contracting operation. It is "The machine that never loafs."

With an "*American*" on the job, the investment is notably reduced, and the general efficiency of every plant is greatly increased. The things left undone are attended to "between times" and instead of the work pushing the men, they are pushing it—getting more and better results all along the line at less cost.

The organization is kept up with less effort and fewer men to "hire and fire," but more is done. The proverbial three crews do not have to be provided —"One coming, one going and one on the job." And the one "on the job" is of size and quality that can be controlled all the time. One can well afford to employ the men that are required, of better calibre, and feel confident of getting things done well, when they should be done.



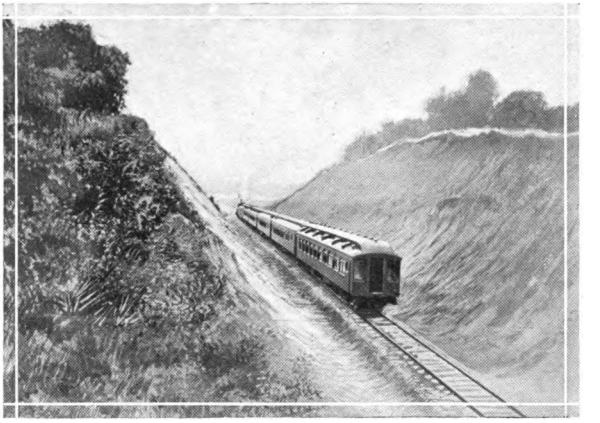
A Few of the "American's" "Stunts"

Among the many appealing time-and-money-saving "Auxiliary uses" of the "*American*," are:

Pile Driving,
Light Wrecking,
Steam Shovel work,
Locomotive Crane work,
Emergency Ditching, or Slide Removing,
Coal, Gravel or Riprap Handling,
Log Loading,
Bridge and Building work,
Clean-up Train work,
Traveler for erecting or razing bridges, etc.
Rail Loading and Unloading,
Track Laying and Relaying,
Material, Tie and Timber Handling,
Grab Bucket Work.

Because of the "Auxiliary Uses," efforts can be concentrated on one job and clean up all parts of it quickly so another job can be started and finished in the same way. With an "*American*" on the job, many things can be done that were left undone before.

The Results



A Clean, Well Ditched Cut

It's a question of investment and **"Results,"** pure and simple. It is easy to pay out quickly in extra labor and make-shift equipment enough to carry the investment in an "*American*" Railroad Ditcher for several years.

One Western General Manager saved the cost price of his "*American*" in two weeks by keeping his road open after a "hand crew" of 200 men had utterly failed. He says: "I would not take $25,000.00 for it if I could not procure another."

The "*American*" made good in such a very pronounced manner for large Southern contractors in track laying alone, before they had an opportunity of trying it at anything else, that they said, "It is more than you claim for it, and that is saying a good deal. $10,000.00 would not buy it if we could not get another."

An "*American*" saved a thousand dollars in cold hard cash in building a mile of road on a Northern line.

TABLE OF CONTENTS